IMPROVED FISHERIES TECHNOLOGIES AND APPROACHES FOR THEIR DISSEMINATION: A CASE STUDY OF NIGER STATE

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ABSTRACT

Technology generation and dissemination are important components of rural transformation programmes. The Nigerian fisheries sub-sector is still bedeviled with low productivity (especially in aquaculture) and low output (capture fisheries and post-harvest technologies). Research institutions and the Universities have made efforts in developing improved technologies to find solution to these problems, yet the level of adoption of the technologies remain low. This is due to a combination of various factors among which are faulty agricultural policies, poor institutional framework and unfavourable socio-economic environment. Niger State plays an important role in fish production in Nigeria and host the only research institute with mandate in inland fisheries. It is important therefore to know the effectiveness of various extension approaches used in disseminating the technologies developed and their impact on adopters. Forty fisher-folks were randomly selected in Shiroro L.G.A. of the State and interviewed. The study probed into their socio-economic characteristics, traditional practices, extent of awareness and adoption of fisheries technologies and the effectiveness and impact of various approaches used by extension organizations to disseminate the technologies. Results show that the economically active age group of the fisher-folks was in the range of 20-50 years (87.5%). Males (95%) dominate the fishing population. 47.5% of the respondents have average household size of 6-10 and 57.5% were below primary school in educational attainment. Only 57.5% belonged to cooperative societies, while 90.0% of the fisher folks have no access to credit other than personal finance. Majority of fish-farmers (60%) operate at homestead level with pond size less than 50 squared meter, stock under poly-culture. Fishing methods are subsistence, while 67.5% of processors use mud-oven to cure freshly caught fish by smoking. Disseminated aquaculture technologies have low level of awareness (5-20%) and adoption (2.5 - 22.5%). For capture fisheries and post-harvest technologies awareness levels of 47.5 - 72.5% and adoption levels of 27.5 - 50.0% were recorded. Method demonstration (87.5%), result demonstration (75.0%) and field days (47.5%) are the major approaches used by the ADP. Respondents were of the opinion that method demonstration (65%), result demonstration (57.5%) and field day (30.0%) are effective. 62.5% of respondents had enhanced income due to impact of extension activities.

1.0 INTRODUCTION

The Nigerian fisheries sub-sector is still be-deviled with low productivity. Although some of the research institutes, universities and polytechnics in the country have done a lot through research in developing improved technologies to find solution to the problem of low productivity, yet the level of adoption of the technologies has remained low. The reasons for low adoption had been due to a combination of factors like faulty agricultural policies, poor institutional framework, unfavourable socio-economic disposition of producers and distorted consumer preferences.

Technology generation and dissemination are important components that enhance productivity in the agriculture. Over the years observation has shown that various institutions have generated a lot of improved technologies, but these have remained on-shelf. Besides there are farmer's practices sources at indigenous level, which hitherto have been the basis of their production. Knowledge and proper documentation of traditional and improved practices/technologies will greatly assist in enhancing fisheries productivity.

Fisheries, like the livestock sub-sector is also at the background in agricultural extension development. Although products from artisanal fisheries contribute significantly to the protein in-take of Nigerians, introduced technologies in time past on motorizations of canoe, development of fishing terminals, and fish smoking kiln improvements, were considered costly to subsistence of fishermen and therefore not sustainable (Arokoyo and Bolorunduro 1995). Fish farming (Aquaculture) is still alien to majority of rural farmers and contribute not less than 8% if the total domestic fish production. Despite these constraints, fisheries research institutions have packaged on-shelf technologies at on-station trials, of which only very few have been disseminated resulting in low adoption level of fisheries technologies (NAERLS 1999). On-shelf technologies available to tackle the low productivity problems include profitable homestead fish pond management, control production of Tilapias, control of common diseases of fish, appropriate species combination and stocking density, development of fast growing species, development of quality feeds for fast and healthy growth, suitable manuring and fertilization procedures, improved smoking kilns, longer shelf life of smoked fish and good fishing methods (NIFFR 1997; NIOMR, 1998, NAERLS 1997). Extension however has been facing an uphill task in channeling these technologies properly to the grass-root due to the peculiarity of fisheries,

inadequate manpower, difficulties in adapting fisheries technology transfer to the OFAR-SPAT of T & V model and reluctance of farmers to adopt fish culture technologies due to initial high cost and scarcity of fisheries inputs.

The general objective for this work is to document the existing technologies developed in fisheries and approaches used in their dissemination. The specific objectives were:

i. Document improved fisheries technologies available in research-extension system.
ii. Identify approaches for technologies dissemination and determine their effectiveness.
iii. Determine fisher-folks' practices, the adoption level of improved practices and their impact.
iv. Identify factors affecting the dissemination of the technologies and problems encountered by farmers in adopting such technologies.

2.0 Methodology

40 fisher-folks were randomly selected at Zumba and Shakona fishing villages in Shiroro L.G.A. of Niger State and interviewed. The structured questionnaire probed into their socio-economic characteristics, traditional occupational practices, level of awareness and adoption of improved fisheries technologies and their impacts and information sources for such technologies. Two other separate questionnaire were also prepared for each of Niger State A.D.P. and NIFFR to probe into fisheries technologies disseminated, strategies for dissemination, and constraints encountered. Simple descriptive and quantitative statistics of frequencies and percentages were used in analyzing the data.

3.0 Results and Discussion

3.1 Socio-Economics Characteristics

Studies have shown that farmers' personal characteristics have some influence on their perceptions of innovations and their decision to either adopt or reject such innovations. Males (95.0%) dominate the fisher-folks population. Although only 5% of the respondents are females, it is significant to note that fishing is not an exclusive male occupation.

Moderate household sizes are common with 35% for those with not more than 5 members and majority (47.5%) having between 6-10 members per household. Most of the fisher-folks (35%) have Eastern education, with 22.5% schooled in non-formal instructional/vocational training. The implication of these is that adoption of modern technologies can be hampered, since level of education is known to be influential in adoption decision of farmers. 32.5% of the fisherfolks have between 1- 10 years experiences in business, while 27.5% have been in the business for between 11-20 years.

Table 1: Personal Characteristics of the respondents.

Characteristics	Freq.	%
Age		
20-30	11	27.5
31-40	11	27.5
41-50	13	32.5
51-60	3	7.5
> 60	2	5.0
Sex		
Male	38	95.0
Female	2	5.0
Household size		
1-5	14	35.0
6-10	19	47.5
11-15	6	15.0
> 15	1	2.5
Highest Education		
Non-Formal	9	22.5
Quranic	14	35.0
Primary	7	17.5
Secondary	4	10.0
Tertiary	6	15.0
Year of Experience		
1-10	13	32.5
11-20	11	27.5
21-30	8	20.0
31-40	5	12.5
> 40	1	2.5

The socio-economics (personal) characteristics of the fisher-folks in Niger State are presented in Table 1. The economically active age groups consist of 20 - 50 years i.e. 87.5% consisting of age groups 20 - 30 (27.5%) 31 - 40 (27.5%) and 41 - 50 (32.5%).

From Tables 2, it can be seen that only 23 fisher-folks (57.5%) belong to cooperative societies, while a significant numbers (42.5%) are non-members of cooperatives. While majority (90%) personally finance their business activities. The implication is that without adequate credit sources fisher-folks would continue to operate at mere subsistence level.

Table2: Membership of Co-operative Societies and Sources of Credit.

Membership of Cooperatives	Frequency	%
Yes	23	47.5
No	17	42.2
Sources of Credit		
Cooperative Societies	5	12.5
Personal Finance	36	90.0
Money lenders	12	30.0
Other Sources	1	2.5

Note - Multiple responses. % > 100.

3.2 Fisher-folks Practices

3.2.1 Fish farmers.

Table 3: Traditional Practices of Fish farmers.

Size of Fish Pond	Freq.	%
25 - 49m²	6	60
50 - 100m²	3	30
> 100m²	1	10
Culture system		
Mono-culture	4	40
Poly-culture	6	60
Feeding level Practice		
Extensive	3	30
Semi-Intensive	7	70

There were only 10 (25%) practicing fish farmers of the survey fisher-folks from Table 3, it can be noted that subsistence characterized the level of operation of fish culture. Small sized or more species of fish in pond and practice semi-intensive feeding (70%). This is practice of supplementing natural fish food with feeds ingredients.

3.2.2 Traditional fishing Methods and Post-harvest Practices

Fishing methods employed by the respondents are basically subsistence in nature leading to very low catch per unit of effort. Methods and gears used include water-bailing fishing with hooks and line, traps and small-scale netting (Table 4).

Table 4: Popular Traditional Fishing Methods by Respondents

Methods Used	Freq.	%
Water bailing	20	50.0
Hooks and line	26	65.0
Traps	25	62.5
Nets	27	67.5
Gura	18	45.0

Nets - include Gill nets, cast net, Beach seining, Drift net etc.
Traps - include Nduruitu, Malian, Atala etc.

Traditional curing practices include use of pit oven, mud oven and drum smokers - while smoked products dominated (75%) with less of sun-drying, frying and freezing (Table 5).

Table 5: Post-harvest curing practices by Respondents

Oven	Freq.	%	Curing Method	Freq.	%
Pit oven	19	47.5	Smoking	30	75.0
Mud oven	27	67.5	Sun-drying	7	17.7
Drum oven	21	52.5	Frying	8	20.0
Charring	17	42.5	Freezing	5	12.5

3.3 Fisheries Technologies Dissemination

In any research - extension system, the development of improved technologies, must be backed up with efficient dissemination. Approaches/strategies used will determine to a great extent the extent of awareness creation and adoption level of such technologies. Improved technologies developed and those disseminated in the study area are discussed below.

3.3.1 Improved Technologies Available

Niger State is located in the middle belt agro ecological zone. The zone hosts a number of research institutes and universities. Specifically the location of the National Cereals Research Institute Badegi (NCRI) and the National Institute for Freshwater Fisheries Research (NIFFR) New-Bussa in the state advantaged the state to directly benefit from improved technologies developed in the institutes mandate areas.

From the survey, the following technologies have been developed by NIFFR

A Aquaculture

i. Homestead fish pond management
ii Precautions for good water quality management
iii Fish pond fertilization
iv Feeding fish in pond
v Species combination and stocking density
vi. Fish fingerlings production
vii Controlled production of Tilapia in outdoor concrete ponds
viii Raising Zooplankton for feeding larval and Post larval stages of fish in hatcheries
ix Transportation of live fish
x Control of some common diseases in fish-ponds.

B Capture Fisheries/Post-harvest

i. Taking care of fish catch
ii Handling fish in inland waters.
iii. Operation and use of Kainji Gas Smoking kiln
iv Fish smoking methods
v. Controlling insect pest menace in dried fish during processing and storage
vi. Prevention of losses in stored dried fish.

3.3.2 Disseminated Technologies

From the records of Niger State ADP and field confirmation from fisher-folks, the following technologies have been disseminated.

A. Aquaculture
   i. site selection and Pond construction
   ii Handling and transportation of fingerlings
   iii Pond fertilization techniques
   iv Improved feeding practices.
   v. Pond disease control.

However, the levels of awareness and adoption of these technologies are low in the state as shown in Table 6.

Table 6: Awareness/Adoption Trends of Disseminated Aquaculture Technologies.

Technologies	Awareness		Adoption		Year(s) adopted	Information Source(s)
	Freq.	%	Freq.	%		
1. Site Selection Ponds and Construction	8	20	8	20	1995-1999	ADP
2. Handling And Trans-portation of Fingerling	6	15	5	12.5	1997-1999	"
3. Pond fertili-zation techniques	9	22.5	9	22.5	1995-2000	"
4. Improved feeding Practices	6	15	5.	12.5	1995-2000	"
5. Pond Disease control	2	5	1.	2.5	1997	"

B. Capture Fisheries/Post-harvest Technologies

i. Improved maintenance of fishing gears
ii. Hygienic handling of freshly caught fish
iii. Use of appropriate fishing mesh size
iv. Preventing losses of fishing gears
v. Keeping hygienic processing site
vi. Improved insect pest menace
vii. Improved fish smoking kiln
viii. Efficient packaging of dried fish
ix. Keeping quality of fresh fish.

Awareness and adoption levels in capture fisheries/post-harvest is higher among fisher-folks in Niger State (Table 7) when compare to aquaculture technologies (Table 6). A major reason for this is that most fisher-folks in the state are more involved in fishing from rivers/lakes, and post harvest activities rather than engage in fish culture.

Table 7: Awareness/Adoption Trends of Disseminate Technologies in Capture Fisheries/Post-harvest Technologies

Technology	Awareness level		Adoption level		Year(s) Adopted	Information Source(s)
	Freq.	%	Freq.	%		
1. Maintenance of fishing gear	19	47.5	13	32.5	1995-1996	MOA
2. Hygienic Handling of Fresh Fish	24	60.0	20	50.0	" "	Radio/ADP
3. Appropriate fishing mesh size	25	62.5	15	37.5	" "	NGO
4. Preventing losses of fishing gears	26	65.0	19	47.5	" "	NGO
5. Hygienic processing size	21	52.5	12	30.0	" "	NSADP
6. Preventing insect pest menace	20	50.0	15	37.7	" "	NSADP/UNDP
7. Improved smoking kiln	29	72.6	20	50.0	" "	UNDP
8. Packaging dried fish	24	60.0	12	30.0	1990	NIFFR
9. Keeping quality of fresh fish	24	60.0	11	27.5	1996	NSADP

MOA - Ministry of Agriculture
NSAP - Niger State Agricultural Development Project
NGO - Non-Governmental Organisations
UNDP - United Nations Development Programme (Artisinal Fisheries Project)
NIFFR - National Institute for Fresh Water Fisheries Research.

The table shows that fisher-folks awareness and adoption of the technologies are at various levels. However, awareness creation of improved smoking kilns seems to have intensified (72.5%) awareness) and this have influence the adoption decision of fisher-folks (50% adoption level). This will significantly reduce losses due to improper smoking of fish catches. At Shakona fishing village in Shiroro Local Government Area, both the UNDP/ADP introduced smoking kilns are popularly in use among fish processors.

From Tables 6 and 7, adoption of the technologies by fisher-folks actually started in 1995; that is four years after the introduction of unified agricultural extension system into multi state ADPs in 1991.

3.4 Constraints to Adoption of Improved Technologies

The adoption of improved agricultural technologies is influenced by socio-economic factors, institutional factors and attributes of such technologies. The study did not probe into the relationship between adoption of technologies and these factors, but rather sampled fisher-folks opinion on possible reasons for non-adoption of technologies.

Table 8: Reasons for Non-adoption of Improved Technologies

Reasons	Freq.	%
High Cost	39	95.0
Handling difficulty	18	45.0
Un-availability of technical support	5	12.5
Non-availability of input	21	52.5
Non-compatibility	3	7.5
No clear relative advantage	5	12.5

Cost, availability of recommended input, and case of handling of recommendation pally major roles in adoption decision of the fisher-folks.

3.5 Methods and Approaches for Information Dissemination:

Conventional extension methods for disseminating information on production recommendations include individual contact, group contact and mass method e.g. radio, T.V., publications etc.; while approaches/ strategies are used to enhance farmers skill in the gradual adoption stage or convince farmers in the long term benefits of a technology. Such approaches include the use of small plot adoption techniques (SPAT), management training plot (MTP), method demonstration, result demonstration, field days and agricultural shows.

The survey reveals that extension agents (EAs) in NSADP employ individual contact methods (40% of respondents) and group contact method (60% of respondents) Table 9).

Table 9: Extension Methods used by EAs to Disseminate Information

Method	Freq.	%
Individual contact	16	40
Group contact	24	60

Method demonstration (87%) and result demonstration (75%) are the most popular approaches used by the VFAs. Field day (47.5%) is also employed by NSADP for mass dissemination. Find constraints limit the organization of agric shows, while MTP is virtually alien to the fisher-folks. The use of SPAT is limited to ADP contact farmers, which are always a very few proportion of farmers in any state (Table 10).

Table 10: Extension Approaches used by EAs to disseminate information.

Approaches	Freq.	%
SPAT	1	2.5
MTP	-	-
Method demonstration	35	87.5
Result demonstration	30	75.0
Field day	19	47.5
Agric shows	-	-

3.5 Effectiveness of Extension Approaches

The effectiveness of an extension approach as perceived by farmers would determine to a great extent the adoption of production recommendations. From this study, 65% of respondents considered method demonstration as effective in influencing their adoption decision as against 57.5% for result demonstration. However, 15% of respondents considered both methods as very effective. Only 30% of fisher-folks considered Field days to be effective (Table 11).

Table 11: Perceived Effectiveness of Extension Approaches

Approach	No effective		Effective		Very Effective	
	Freq.	%	Freq.	%	Freq.	%
SPAT	-	-	1	2.5	-	-
MTP	-	-	-	-	-	-
Method Demonstration	3	7.5	26	65	6	15
Result Demonstration	4	5	23	57.5	6	15
Field day	1	2.5	12	30.0	4	10
Agric Show	-	-			-	-

3.7 Agencies and Channels for Information dissemination on Fisheries Technologies

Table 12 shows the agencies involved in disseminating information on fisheries technologies in Niger State and regular information as confirmed by fisher-folks. The NSADP (97.5%) and the Fisheries Division of the State Ministry of Agriculture (82.5%) play leading roles in reaching the fisher-folks with information. However, regular channels of information include EAs (97.5%), Radio (85%) and Friends (77.5%).

Table 12: Agencies and Channels of Information Dissemination on Fisheries.

Production Recommendations in Niger State

Agencies	Freq.	%
NSADP	39	97.5
Research Institutes	12	30.0
NGO	5	12.5
MOA	33	85.5
FDF	8	20.0
Channels		
Radio	34	85.0
T.V.	14	35.0
Friends	31	77.5
EAs	39	97.5
Extension Publications	3	5.0

3.8 Impact of Extension Activities

All extension activities have definite goals and objectives. In summary increase in level of income, and productivity, enhancement of farmers' skill, and efficient use of resources are major goals in agricultural extension. When such are achieved measurable impacts have taken place on farmers. Attempt was made in the present study of extension activities on fisher-folks. Result shows that 62.5% of respondents had enhanced income after adopting improved fish processing technologies, 55% had increase in income from adopting capture fisheries technologies, 42.5% had enhanced nutrition, while 55% developed confidence in extension through increased adoption of other improved technologies (Table 13).

Table 13: Impact of Extension Activities on Fisher-folks

Impact Indicators	Freq.	%
Changes in cropping patters	7	17.5
Enhanced yield from fish culture	6	15.0
Increased income from fishing	22	55.0
Changes in quality of food consumed	17	42.5
Enhanced income from fish processing	25	62.5
Enhanced adoption of improved technologies	22	55.0
No impact	2	5.0

3.9 Factors Affecting Fisheries Technologies Dissemination

From experiences of NIFFR and NSADP, the following are factors affecting their efforts in disseminating fisheries technologies.

i. Lack of reliable field vehicles
ii High cost of spare parts to service existing vehicles
iii Lack of field equipments like excavators, and adequate kilns
iv Scarcity of recommended inputs and non-availability to fisher-folks
v Inadequate funding of extension activities
vi Lack of technology demonstration centers to serve as venue for MTPS.
vii Shortage of manpower, especially VEAs to adequately cover all the zones.

4.0 Recommendations and Conclusion

Although fisheries extension fully came on board in the unified agricultural extension system of the multi-state ADPs in 1991, extension in the sub-sector can at best be described as an emerging effort. Along this out look the study has shown that the development of on-shelf technologies are not just issues but having an efficient extension system with appropriate approaches in their dissemination. Findings revealed an adequate development of the technologies, but the problem of efficient dissemination reflects in the low level of awareness and adoption of fisheries technologies in Niger State.

Based on these findings the following are recommended measures in improving the level of awareness and adoption of fisheries technologies.

1. Extension agencies should be adequately funded to provide necessary logistical support for staff field visits, and mass dissemination of available technologies.
2. The contact farmer approach should be revisited. In most cases adoption of technologies by contact farmers are mistakenly adjudged to represent mass adoption. Group contact approach could be an alternative.
3. Effort should be made to have sufficient technology demonstration centers to show practically the know-how of recommendations to fisher-folks/farmers.

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